-- A N T I M O N Y A N D I T S C O M P O U N D S --

(Antimony) (Antimony hydride)

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Columbus
1940

This material compiled by the Adult Hygiene Division of the
Ohio Department of Health, assisted by the personnel of
Work Projects Administration in Ohio, Official
Project No. 665-42-3-413.
1940

-- A N T I M O N Y A N D I T S C O M P O U N D S --

The compounds of antimony have been known from ancient times. Basilius Valentinus, reputed to have been a Benedictine Monk, was the author of the "Triumphal Chariot of Antimony" during the latter part of the fifteenth century. He rendered a real service in characterizing the metal antimony. The metal was definitely known to A. Libavius as early as 1615.

Ramazzini was the first to have reported on the effects of antimony on chemists. Antimony, lead and arsenic often occur together and it is sometimes difficult to diagnose the poisoning.

GENERAL INFORMATION

CHEMICAL FORMULA AND SYNONYMS:

(Antimony) Sb, antimony regulus.

(Antimony hydride) SbH_3, stibine, antimoniuretted hydrogen.

PROPERTIES:

(Antimony) Gray metal sometimes found native. Sp. gr. 6.5 to 6.86 (variously stated); m. p. 630°C.; b. p. 1440°C. Soluble in acids.

(Antimony hydride) Colorless gas. Sp. gr. 2.26 at 25°C.; m. p. -88°C.; b. p. -18°C. Solubility, 0.41 parts in 100 parts of cold water. Wt. per liter, 5.19 gr.

OCCURRENCE:

(Antimony) Sometimes found native. Also as cervantite, dyscrasite, jamesonite, nagyagite, polybasite, stibiconite, and stibnite.

PREPARATION:

(Antimony) Stibnite is roasted in air to remove the sulfur. The white oxide which remains is mixed with carbon and reduced with strong heat.

(Antimony hydride) Action of nascent hydrogen on metallic antimony or its compounds.

IMPORTANT COMPOUNDS:

(Antimony) Antimony-chloride, antimony cinnabar, antimony-crocus, antimony fluorides, antimony-glass, antimony lactate, antimony-ocher, antimony oxides, antimony-oxychloride, antimony oxysulfide, antimony-potassium tartrate, antimony-red, antimony salt, antimony sulfate,

antimony sulfide; antimony, sulfurated; antimony tribromide, antimony white, antimony yellow.

USES:

(Antimony) Various alloys (type metal, Brittania metal, sterotype metal, bearing metal, pewter); bath tub enamels; antimony compounds.

(Antimony hydride) By-product where antimony containing metals are subjected to reducing conditions.

INDUSTRIAL HEALTH ASPECTS

SYMPTOMS OF INDUSTRIAL POISONING:

(Antimony) Symptoms of occupational antimony poisoning are difficult to define. Most of the antimony of industry contains traces of arsenic and it is practically always used in conjunction with lead. It is evident that under such conditions a clear clinical picture would be impossible. However, symptoms of antimony poisoning have been described as follows: tightness of the chest, cough, swelling of the throat, gastro-intestinal disturbances, pustular eruptions especially the scrotum, difficult urination, loss of sexual desire, eosinophilia, and nervous symptoms of many different varieties.

(Antimony hydride) The toxic action of antimoniuretted hydrogen or stibine is similar to arsine but less potent. It attacks the central nervous system and the blood. The symptoms of acute poisoning are headache, weakness, nausea, retarded breathing, weak, slow, and sometimes irregular pulse, lowered temperature, and diuresis. Antimoniuretted hydrogen is often encountered as a by-product as in the preparation of hydrogen from zinc. Other toxic impurities such as arsine frequently appear in the same processes.

INDUSTRIES AND OCCUPATIONS

INDUSTRIES: Ohio Industries using antimony and its compounds as indicated in the Ohio Industrial Hygiene Survey are listed as follows:

Blast furnaces
Brass factories
Car and railroad shops
Chemicals
Electrical machinery
Foundries
Match factories
Metal furniture
Other metals
Potteries
Printing
Rubber tires
Shoes
Storage batteries
Tin and enameled ware
Toys and unclassified novelties

OCCUPATIONS: Occupations in Ohio where contact with antimony and its compounds was indicated are listed as follows:

Assemblers (chemicals; metal furniture; storage batteries)
Babbiting machine operators (brass factories)
Babbit pourers (foundries)
Banbury operators (rubber tires)
Band saw operators (brass factories)
Beaders (tin and enameled ware)
Buffers (other metals)
Casters (other metals; storage batteries)
Checkers (storage batteries)
Chemical mixers (toys and unclassified novelties)
Compounders (rubber tires)
Die cast operators (brass factories)
Dippers (potteries; tin and enameled ware)
Element burners (storage batteries)
Enamel bakers (foundries)
Enamel makers (tin and enameled ware)
Foremen (chemicals; metal furniture; storage batteries)
Foundry men (chemicals; storage batteries)
Fuse assemblers (chemicals)
General truckers (storage batteries)
Hand moulders (storage batteries)
Hand tool operators (brass factories)
Inspectors (storage batteries)
Janitors (printing)
Laboratory assistants (storage batteries)
Lathe operators (other metals)
Linotype operators (printing)
Loaders (storage batteries)
Machine builders (storage batteries)
Machine operators (blast furnaces; storage batteries)
Machinists (blast furnaces; shoes)
Mechanics (storage batteries)
Melters (brass factories; printing)
Meter assemblers (electrical machinery)
Mill men (rubber tires)
Mixers (chemicals; match factories)
Monotype operators (printing)
Mould cleaners (storage batteries)
Moulders (brass factories; electrical machinery; metal furniture)
Multi cut saw operators (brass factories)
Oilers (blast furnaces; storage batteries)
Packers (chemicals; storage batteries)
Pasters (toys and unclassified novelties)
Punch press operators (storage batteries)
Receiving clerks (brass factories; rubber tires)
Refiners (storage batteries)
Scalemen (storage batteries)

Shake out men (brass factories)
Spongers (tin and enameled ware)
Spray painters (foundries; tin and enameled ware)
Stampers (toys and unclassified novelties)
Stencil men (storage batteries)
Storage men (chemicals)
Strappers (storage batteries)
Strap supply men (storage batteries)
Supply men (storage batteries)
Sweepers (storage batteries)
Tool makers (storage batteries)
Touch up men (storage batteries)
Truckers (storage batteries)
Unloaders (storage batteries; car and railroad shops)
Welders (foundries)
Wheelers (storage batteries)

Occupations which offer contact with antimony and its compounds but not listed in the Ohio Survey are:*

Burnishers (riffle barrels)
Calico printers
Chargers (zinc smelting)
Color makers
Copper refiners
Dye makers
Electroplaters
Filers
Glass mixers
Lead smelters
Mordanters
Rubber (red) workers
Shot makers
Vulcanizers
Zinc refiners

*Dublin, L.I., and Vane, R.J.: Occupation Hazards and Diagnostic Signs. U.S. Department of Labor, Bureau of Labor Statistics, Bulletin No. 582:29, 1933.

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PATHOLOGICAL FINDINGS IN ANTIMONY POISONING.

G. Franz. Arch. exptl. Path. Pharmakol. 186, 661-70 (1937).
Chemical Abstracts, vol. 32, p. 7103.

The tissues principally affected in rabbits poisoned with tartar emetic are the liver, kidney and heart, the first to show degenerative change being the convoluted tubules of the kidney. Fatty degeneration, which then sets in in the liver, affects first the center of the lobule where the Sb is given by the mouth or the periphery when it is given by injection. There is no evidence that the action is primarily on the capillaries: Sb is a direct parenchyma poison. The affected tissues contain granules, thought to be of Sb_2S_3.

ANTIMONY, ITS HISTORY, PRODUCTION, AND USE IN INDUSTRY AND ITS POISONOUS EFFECT.

I. Habeck. Verof. a. d. Gebiete d. Medizinalverwaltung, vol. 45, pp. 657-702 (No. 404, pp. 1-46, 1935).
Abstracted in J. of Ind. Hygiene, vol. 18, no. 4, p. 51 (abstract section) Apr. 1936.

Industrial antimony poisoning is mentioned in the section on chronic antimony poisoning. The author discusses the results, in this connection, of Baader, Schrumpf and Zabel, and Seitz; in all three studies a marked lowering of the leucocyte count was found. In order to obtain a true picture, the author quite rightly believes it is necessary to have an accurate and careful series of observations.--L. Teleky.

PHARMACOLOGY OF ARSENIC AND ANTIMONY.

H.A. Oelke. Arch. f. exp. Pathol. u. Pharmak., vol. 184, pp. 286-288 (1937).
Abstracted in J. of Ind. Hygiene, vol. 19, no. 4, p. 82 (abstract section) April 1937.

On the basis of his earlier experiments, the author concludes that arsenic and tartat emetic are general cell poisons whose action disturbs vesicular breathing and also checks albumin fermentation and fat metabolism as well as, according to the literature, carbohydrate metabolism. The view held by many that the action of these substances causes capillary paralysis frequently does not hold true.--L. Teleky.

OCCUPATIONAL DISEASE OCCURRING IN A BUFFER WORKING ON BRITANNIA METAL.

U.S. Month. Labor Rev., Jan. 1926, vol. 22, pp. 184-185.
Abstracted in J. of Ind. Hygiene, vol. 8, no. 12, pp. 215-216 (abstract section) Dec. 1926.

The material presented here, from Kober and Hayhurst's "Industrial Health" and W. Gilman Thompson's "The Occupational Diseases", relates to the general effects of fatigue and to the effects of antimony which constitutes 8 to 10 per cent of Britannia metal and seems to be the dangerous

constituent. The information was compiled in answer to an inquiry regarding a case of neuritis which was believed to have been caused by the fatigue of buffing complicated possibly by the effects of Britannia metal.--M.C.S.

ANTIMONY POISONING DUE TO THE USE OF ENAMELED VESSELS.

Abstracted as follows from Ministry of Health, Memo 171, Med., pp. 3. H.M. Stationery Office, 1933, in Bull. Hyg., June, 1933, vol. 8, p. 445.

Abstracted in J. of Ind. Hygiene, vol. 15, no. 6, p. 120 (abstract section) Nov. 1933.

Antimony oxide is widely used as an opacifying agent in the enameling of hardware on account of its comparative cheapness. In the low-grade enamels the enamel matrix enclosing the oxide particles is not an adequate protection. These enamels are made from a mixture relatively low in silica content and are fired at a comparatively low temperature. They are not acid proof and appear to be readily dissolved by citric, tartaric, acetic and other acids present in food, thus exposing the antimony oxides which are dissolved. If such vessels are used for acid drinks such as lemonade toxic amounts are dissolved. The report contains particulars of three outbreaks so caused. The first in 1928 at Newcastle-upon-Tyne resulted in 70 cases of tartar emetic poisoning, the solvent being lemonade made from "lemonade" crystals. The second at Folkestone in 1929 affected 25 to 30 persons, the vehicle being lemonade made from fresh lemons. The third in 1932 was in a London hospital and affected 65 nurses, again from lemonade made from fresh fruit. In each instance the antimony was derived from enamelled vessels.

HEALTH OF ANTIMONY OXIDE WORKERS.

T. Oliver. Brit. Med. Jour., June 24, 1933, pp. 1094-1095.

Abstracted in J. of Ind. Hygiene, vol. 15, no. 5, p. 96 (abstract section) Sept. 1933.

Antimony trioxide, (Sb_2O_3), in the form of a fine white powder, is made in large quantities for pigmentary purposes; although generally considered as non-toxic, if the skin is damp with sweat, it sets up irritation and minute pustules. An investigation is reported wherein men employed for many years as antimony smelters were carefully examined. They looked older than their stated ages and were swarthy in appearance, but no signs of ill health could be detected. The blood pressure was rather low. Antimony was found in the feces, varying in amount with the exposure to dust but none could be detected in the urine. The conclusion drawn is that antimony trioxide presents no industrial hygienic problem or risk.--E.L.C.

HYGIENE IN TYPE FOUNDRIES AND EXPERIMENTAL ANTIMONY POISONING.

A. Seitz. Arch. f. Hyg., 1924, vol. 94, pp. 284-297.

Abstracted in J. of Ind. Hygiene, vol. 7, no. 11, p. 188 (abstract section) Nov. 1925.

In type foundries the former danger due to steaming acrolein is no longer a menace. The presence of carbon monoxide and gaseous hydrocarbons could not be demonstrated by the author. Type foundries no longer use a metal containing arsenic as an impurity, hence gaseous arsenic compounds formed during type molding are not to be feared. It seems therefore that

the poor health conditions of the workers, particularly of the women, are due chiefly to the heated and stagnant atmosphere in the buildings, and to the nauseating gaseous products formed. Another important factor is gastro-intestinal poisoning due to antimony, which next to lead is one of the chief components of the dust present in the foundry.

The effect of antimony poisoning on experimental animals was investigated. The blood picture of these animals showed changes similar to those obtained in the blood picture of workers in type foundries. The essential points in these changes were: a reduction of neutrophils, an increase in mononuclears, chiefly small lymphocytes, and an initial decrease in red blood cells, followed by a subsequent increase.

If one arranges the workers connected with type foundries in groups, one arrives at the conclusion that type foundries themselves do not show the highest sickness rate from lead poisoning--15.7 per cent as compared with adjusters, who show a rate of 23.3 per cent. Other diseases also occur less frequently in the type founders than in the other groups connected with printing. Women seem to suffer more than men, and this is important since it causes arrest in development of the fetus.

INDUSTRIAL SKIN LESIONS FROM SALTS OF ANTIMONY IN THE TEXTILE INDUSTRY.

A.B. Selisky. Abstr. as follows from Dermat. Wchnschr., 1928, vol. 86, pp. 723-727, in Bull. Hyg., Feb., 1929, vol. 4, p. 170.

Abstracted in J. of Ind. Hygiene, vol. 11, no. 5, p. 125 (abstract section) May 1929.

The author describes occurrence of some 200 cases (including relapses) of industrial skin lesions due to the use as a mordant of solutions of salts of antimony in cloth dyeing. The form assumed was a pustular, necrotic dermatitis commencing usually as a folliculitis and ending in an atrophic scar. Usually the arms were affected. A perifollicular abscess formation was found histologically.

Etiologically the author believes that acid intermediate products, which are formed when antimony salts are used for mordanting, were responsible for the trouble. The condition was much the worst in the summer months and, in order to neutralize the excess of acid intermediate products, the author recommended addition of chalk. This step was followed by notable remission. After four months the chalk was given up on technical grounds, when the cases again became more numerous.

Use of indiarubber gloves and smearing the skin with vaseline is naturally of value.--T.M.L.

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Hamilton, A.: Indust. Toxicology. Harper and Brothers, New York, 1934, pp. 96-98.

Kober, G., and Hayhurst, E.: Industrial Health. P. Blakiston's Son and Co., 1924, pp. 583-584.

McNally, W.: Toxicology. Industrial Medicine, Publishers, Chicago, 1937, pp. 285-290.

Occupation and Health. International Labour Office, Geneva, 1934. pp. 155-159.